1,074,826

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,074,826

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Int. Cl.:—F 23 d

COMPLETE SPECIFICATION

Fuel Gas/Oxygen Burner

We, THE GAS COUNCIL, a British Body Corporate, of 4—5 Grosvenor Place, London, S.W.1., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fuel gas/oxygen burners.

The present invention consists in a nozzle-mixing fuel gas/oxygen burner comprising a duct adapted to be connected to an oxygen supply, and a duct adapted to be connected to a fuel gas supply, the ducts leading to a nozzle plate through which are oxygen passages open to the oxygen duct and gas passages open to the gas duct, the exit ends of the passages being at the front face of the nozzle plate, the exit ends of the gas passages being disposed as outer and inner gas exits, the outer exit ends being outwards of the exit ends of the oxygen passages and the inner exit ends being disposed inwards of the exit ends of the oxygen passages or being directed inwards of the direction of the exits of the oxygen passages.

The terms outer and inner are used herein to refer to radial or lateral relationship with respect to a central axis or plane of the burner.

As the burner is nozzle mixing the explosion hazard to which large, premixing fuel gas/oxygen burners are liable is avoided.

The arrangement of the exits of the passages at the front face of the nozzle plate results in the issuing gas and oxygen streams meeting over a large interfacial area, the inwardly disposed or directed gas exits providing access for the gas to the inner surfaces of the oxygen streams. Gas issuing from the outwardly disposed gas exits, in addition to contributing part of the interfacial area for combustion prevents the ingress of the surrounding atmosphere to the reacting gas and oxygen streams and prevents the egress from the flame of undiluted oxygen which might be detrimental to the work piece.

An advantage of the burner according to the invention is that it provides the large surface area of contact between fuel gas and oxygen necessary for efficient combustion, yet it can be simple in construction and reasonably quiet in operation. A stable flame is obtainable at fuel gas and oxygen velocities which do not cause excessive noise.

The burner may be constructed differently or be of other shapes, but it is convenient to arrange the oxygen duct within the gas duct and to use tubes one within another, for example co-axial tubes of circular cross-section, for the inner duct for oxygen and to define the outer duct for the fuel gas, and a thick plate of disc shape as the nozzle plate. In a simple, un-cooled burner with two co-axial tubes the bore of the inner tube can be the oxygen duct and the annular space between the inner and outer tubes be the gas duct.

Alternatively the nozzle plate may be rectangular with the exit ends of the passages disposed in parallel rows.

The burner may be cooled by an external or internal water jacket preferably by both, for example around the outer tube and inside the bore of the innter tube.

The water jackets preferably extend into the nozzle plate. The water jackets may be formed by additional co-axial tubes surrounding the outer tube and inside the inner tube so that the oxygen duct is also formed by an annular space, in this instance between the inside surface of the inner tube and the outside surface of the water jacket. Both water jackets preferably have co-axial tubular partitions which do not extend quite to the forward end of the water jacket and so allow the water to be circulated from an inlet in a forward direction along one side of the partition to the front end of the jacket, around the end

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of the partition and back on the opposite side of the partition to an outlet.

The passages through the nozzle plate are preferably rings or rows of straight holes of circular cross-section disposed so that the holes forming the oxygen passages cross, without connection, the inner ring or row of holes forming the gas passages.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings in which:—

Figure 1 is a longitudinal section taken on line 1—1 of Figure 2 of a simple burner according to the invention

Figure 2 is an end view of the nozzle plate of the burner of Figure 1 to a larger scale

Figures 3 and 4 are views similar to Figures 1 and 2 of a water-cooled burner, Figure 3 being on line 3—3 of Figure 4

Figures 5 and 6 are views similar to Figures 1 and 2 of a burner with a rectangular nozzle plate, Figure 5 being on line 5—5 of Figure 6.

Referring first to the simple burner of Figures 1 and 2, this comprises an inner tube 7 of circular cross-section, an outer tube 8 co-axial with the inner tube 7 and also of circular cross-section and a thick, disc-shaped nozzle plate 9. The inner tube 7 projects rearwards through an annular end closure 10 for connection to the oxygen supply. Its bore 12 forms the oxygen duct. A lateral connection 11 is provided for connecting the fuel gas supply to the annular space 14 defined between the tubes 7 and 8 and forming the gas duct.

Through the nozzle plate 9 there are straight holes of circular cross-section of which those 13 which open into the oxygen duct 12 are parallel to the axis of the burner and form oxygen passages while those 15 and 16 which open into the gas duct 14 and form gas passages are inclined inwards towards the axis of the burner. The passages 15 are more steeply inclined than the passages 16 and pass between the oxygen passages 13. The exit ends of the passages are arranged in rings, the exit ends 16^1 of the passages 16 being disposed outwards of the exit ends 13^1 of the oxygen passages 13. The exit ends 15^1 of the gas passages 15 are almost in the same ring as the exit ends 13^1 of the oxygen passages 13 but being inwardly inclined are directed inwards of the direction of the exit ends 13^1.

In a water cooled burner of Figures 3 and 4 equivalent parts bear similar reference numerals. Additional co-axial tubes 17, around the outer tube 8, and 18, inside the inner tube 7, form external and internal water-jackets 19 and 20 which extend forwards into recesses in the back of the nozzle plate 9. Further co-axial partition tubes 21 and 22 divide the water jackets 19 and 20 into flow and return portions. Flow and return cooling water connections 23 and 24 are provided at the rear end of the burner.

The burner of Figures 5 and 6 differs from Figures 1 and 2 mainly in the shape of the nozzle plate which is rectangular with the exit ends of the passages disposed in rows. The gas passages are inclined inwards towards the central plane of the burner instead of towards the central axis. The gas duct is in separate upper and lower parts 25 and 26 which are fed with gas from a supply pipe 27 by branch pipes 28. The two parts 25 and 26 are separated by the oxygen duct 12 which is therefore sandwiched between the two parts of the gas duct.

WHAT WE CLAIM IS:—

1. A nozzle-mixing fuel gas/oxygen burner comprising a duct adapted to be connected to an oxygen supply, and a duct adapted to be connected to a fuel gas supply, the ducts leading to a nozzle plate through which are oxygen passages open to the oxygen duct and gas passages open to the gas duct, the exit ends of the passages being at the front face of the nozzle plate, the exit ends of the gas passages being disposed at outer and inner gas exits, the outer exit ends being outwards of the exit ends of the oxygen passages and the inner exit ends being disposed inwards of the exit ends of the the oxygen passages or being directed inwards of the direction of the exit ends of the oxygen passages.

2. A nozzle-mixing fuel gas/oxygen burner according to claim 1 wherein the oxygen duct is within the gas duct or between parts of the gas duct.

3. A nozzle-mixing fuel gas/oxygen burner according to claim 2 wherein the burner comprises tubes one within another to define the gas and oxygen ducts.

4. A nozzle-mixing fuel gas/oxygen burner according to claim 3 wherein the tubes are co-axial and circular in cross-section.

5. A nozzle-mixing fuel gas/oxygen burner according to claim 4 wherein the tubes are co-axial the bore of the inner tube forming the oxygen duct and the annular space between the inner and outer tubes forming the outer duct.

6. A nozzle-mixing fuel gas/oxygen burner according to claim 1 or 2 wherein the nozzle plate is rectangular, the exit ends of the passages being disposed in parallel rows.

7. A nozzle-mixing fuel gas/oxygen burner according to claim 6 wherein the gas duct is in two parts each adapted to be connected to the gas supply and separated by the oxygen duct which is therefore sandwiched between the two parts of the gas duct.

8. A nozzle-mixing fuel gas/oxygen burner according to any preceding claim wherein the passages through the nozzle plate are straight holes of circular cross-section arranged in rings or rows and so disposed that the holes forming the oxygen passages cross, without connection, the gas passages having exit ends inwards or

directed inwards of the exit ends of the oxygen passages.

9. A nozzle-mixing fuel gas/oxygen burner according to claim 8 as appendant to claim 2 wherein the gas passages are inclined inwards towards the central axis or plane of the burner, those having exit ends inwards or directed inwards of the exit ends of the oxygen passages being more steeply inclined.

10. A nozzle-mixing fuel gas/oxygen burner according to any preceding claim wherein the burner is water cooled.

11. A nozzle mixing fuel gas/oxygen burner according to claims 4 and 10 wherein the burner is cooled by a water jacket or water jackets formed by an additional co-axial tube or tubes.

12. A nozzle-mixing fuel gas/oxygen burner according to claim 11 wherein the additional co-axial tubes are disposed around the outer tube and inside the inner tube and form outer and inner water jackets.

13. A nozzle-mixing fuel gas/oxygen burner according to any one of claims 10 to 12 wherein a, or the, water jacket is dived by a partition, extending from the rear nearly to the front of the water jacket, into flow and return portions to which flow and return cooling water connections are provided at the rear of the water jacket.

14. A nozzle-mixing fuel gas/oxygen burner according to any one of claims 8 to 10 wherein the cooling water extends into the nozzle plate.

15. A nozzle-mixing fuel gas/oxygen burner substantially as described herein with reference to and as illustrated by, Figures 1 and 2 of the accompanying drawings.

16. A nozzle-mixing fuel gas/oxygen burner substantially as described herein with reference to and as illustrated by Figures 3 and 4 of the accompanying drawings.

17. A nozzle-mixing fuel gas/oxygen burner substantially as described herein with reference to and as illustrated by Figures 5 and 6 of the accompanying drawings.

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from which copies may be obtained.

Fig. 1.

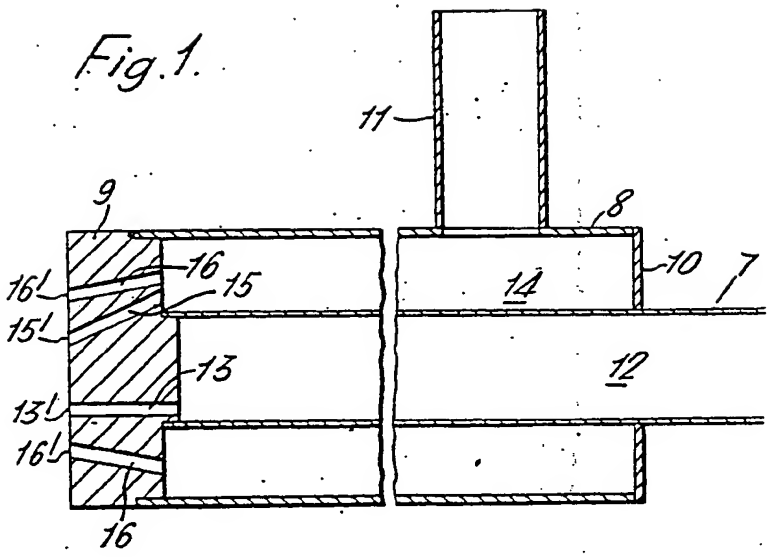
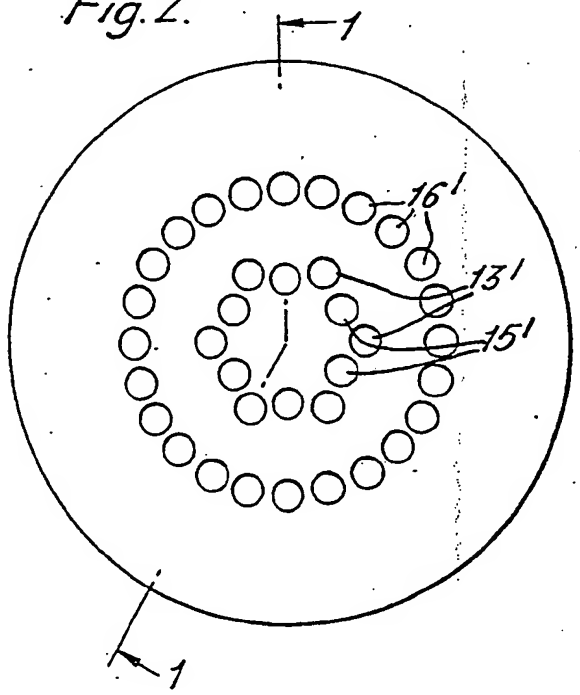


Fig. 2.



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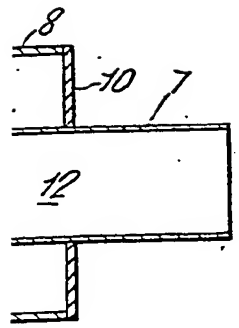
4 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheets 1 & 2



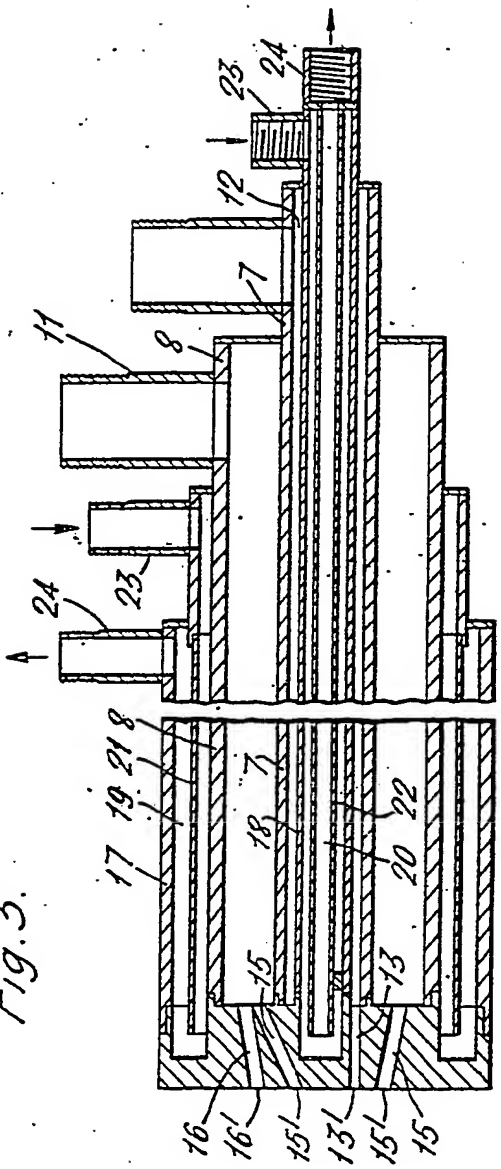


Fig. 3.

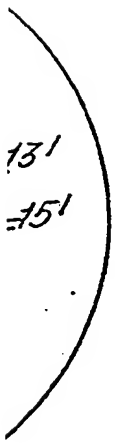


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Fig.1.

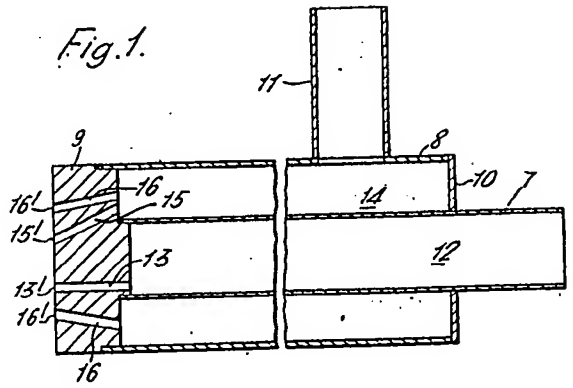

Fig.2.

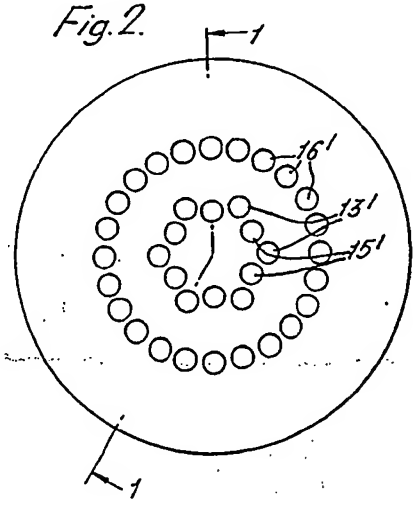

Fig.3.

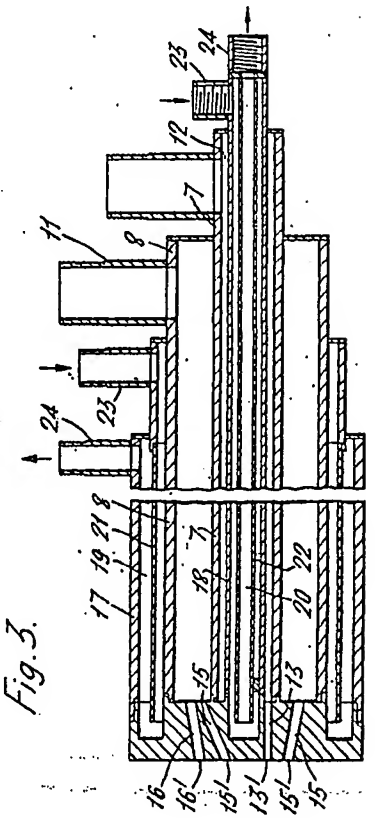

Fig. 4.

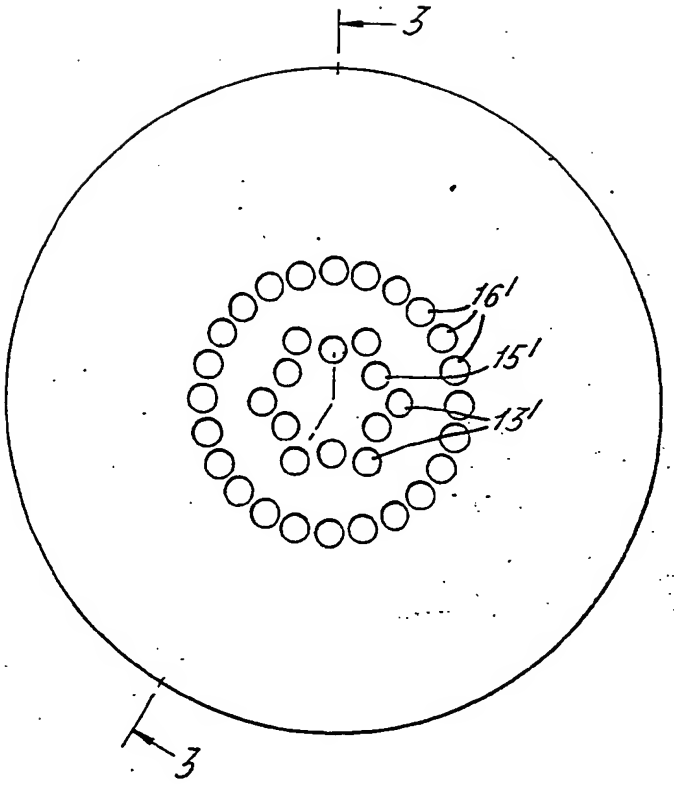

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Fig.6.

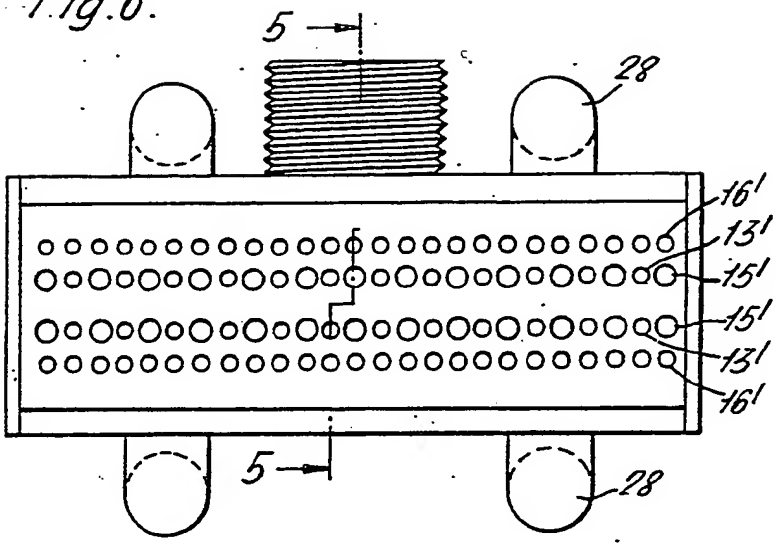

Fig.5.

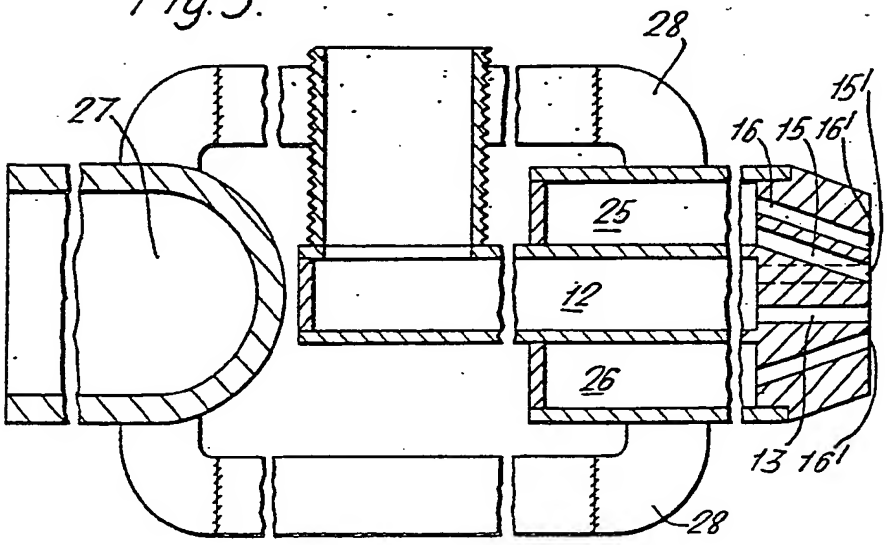

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Fig.4.

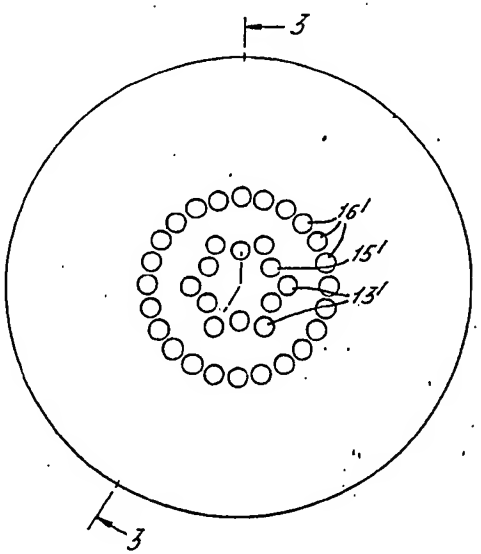

Fig.6.

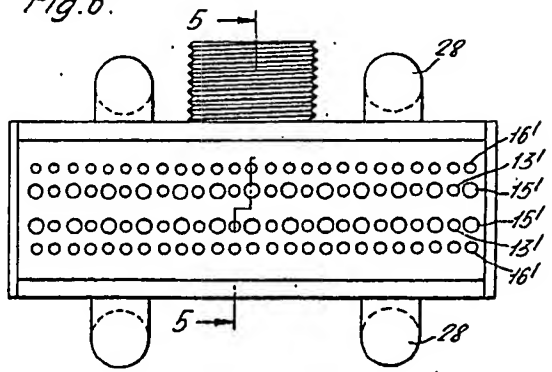

Fig.5.